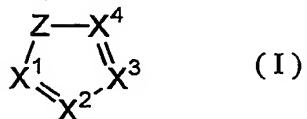


## CLAIMS

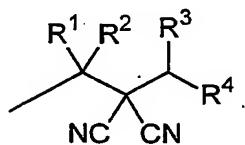
1. A malononitrile compound represented by the formula

(I):



5 wherein any one of  $X^1$ ,  $X^2$ ,  $X^3$  and  $X^4$  is  $CR^{100}$ ,

(wherein  $R^{100}$  represents a group represented by the formula:



wherein  $R^1$  represents C1-C5 alkyl optionally substituted with one or more halogen, C2-C5 alkenyl optionally substituted with one or more halogen, C2-C5 alkynyl optionally substituted with one or more halogen, or hydrogen,

10  $R^2$  represents C1-C5 alkyl optionally substituted with one or more halogen, C1-C5 alkoxy optionally substituted with one or more halogen, C2-C5 alkenyl optionally substituted with one or more halogen, C2-C5 alkynyl optionally substituted with one or more halogen, cyano or hydrogen,

15  $R^3$  and  $R^4$  each represent C1-C5 alkyl optionally substituted with one or more halogen, C2-C5 alkenyl optionally substituted with one or more halogen, C2-C5 alkynyl optionally substituted with one or more halogen, C3-C5 cycloalkyl optionally substituted with one or more halogen,

20

C4-C5 cycloalkenyl optionally substituted with one or more halogen, or hydrogen,  
or R<sup>3</sup> and R<sup>4</sup> are taken together to represent C2-C6  
alkanediyl optionally substituted with one or more halogen  
5 or C4-C6 alkenediyl optionally substituted with one or more  
halogen),  
the other three of X<sup>1</sup>, X<sup>2</sup>, X<sup>3</sup> and X<sup>4</sup> each represent nitrogen  
or CR<sup>5</sup>, provided that one to three of X<sup>1</sup>, X<sup>2</sup>, X<sup>3</sup> and X<sup>4</sup>  
represent nitrogen,  
10 Z represents oxygen, sulfur or NR<sup>6</sup>,  
R<sup>5</sup> independently represents halogen, cyano, nitro, hydroxyl,  
mercapto, formyl, SF<sub>5</sub>, carboxyl, C1-C5 alkyl optionally  
substituted with one or more halogen, C2-C5 alkenyl  
optionally substituted with one or more halogen, C2-C5  
15 alkynyl optionally substituted with one or more halogen,  
C3-C6 cycloalkyl optionally substituted with halogen or one  
or more C1-C3 alkyl, C1-C5 alkoxy optionally substituted  
with one or more halogen, C3-C6 alkenyloxy optionally  
substituted with one or more halogen, C3-C6 alkynyloxy  
20 optionally substituted with one or more halogen, C1-C5  
alkylthio optionally substituted with one or more halogen,  
C3-C5 alkenylthio optionally substituted with one or more  
halogen, C3-C5 alkynylthio optionally substituted with one  
or more halogen, C1-C5 alkylsulfinyl optionally substituted  
25 with one or more halogen, C1-C5 alkylsulfonyl optionally

substituted with one or more halogen, C<sub>2</sub>-C<sub>6</sub> alkylcarbonyl  
optionally substituted with one or more halogen, C<sub>2</sub>-C<sub>5</sub>  
alkoxycarbonyl optionally substituted with one or more  
halogen, a group represented by NR<sup>10</sup>R<sup>11</sup>, a group represented  
5 by C(=X<sup>5</sup>)NR<sup>12</sup>R<sup>13</sup>, a group represented by (CH<sub>2</sub>)<sub>m</sub>Q, a group  
represented by C(=NOR<sup>17</sup>)R<sup>18</sup>, a group represented by  
C(OR<sup>19</sup>)R<sup>20</sup>R<sup>21</sup>, or hydrogen,  
R<sup>6</sup> represents C<sub>1</sub>-C<sub>5</sub> alkyl optionally substituted with one  
or more halogen, C<sub>3</sub>-C<sub>5</sub> alkenyl optionally substituted with  
10 one or more halogen, C<sub>3</sub>-C<sub>5</sub> alkynyl optionally substituted  
with one or more halogen, C<sub>3</sub>-C<sub>6</sub> cycloalkyl optionally  
substituted with one or more halogen, (C<sub>1</sub>-C<sub>5</sub> alkoxy  
optionally substituted with one or more halogen)C<sub>1</sub>-C<sub>3</sub> alkyl,  
C<sub>1</sub>-C<sub>5</sub> alkylsulfinyl optionally substituted with one or more  
15 halogen, C<sub>1</sub>-C<sub>5</sub> alkylsulfonyl optionally substituted with  
one or more halogen, C<sub>2</sub>-C<sub>6</sub> alkylcarbonyl optionally  
substituted with one or more halogen, C<sub>2</sub>-C<sub>5</sub> alkoxycarbonyl  
optionally substituted with one or more halogen, a group  
represented by C(=X<sup>5</sup>)NR<sup>12</sup>R<sup>13</sup>, a group represented by (CH<sub>2</sub>)<sub>m</sub>Q,  
20 or hydrogen, and  
when two CR<sup>5</sup>, or CR<sup>5</sup> and NR<sup>6</sup> are adjacent to each other,  
they may be taken together to represent C<sub>2</sub>-C<sub>6</sub> alkanediyl or  
C<sub>4</sub>-C<sub>6</sub> alkenediyl optionally substituted with one or more  
halogen, in which at least one methylene group forming the  
25 alkanediyl or the alkenediyl may be substituted with oxygen,

sulfur or NR<sup>7</sup>,

R<sup>7</sup> represents C1-C5 alkyl optionally substituted with one or more halogen, C3-C5 alkenyl optionally substituted with one or more halogen, C3-C5 alkynyl optionally substituted with one or more halogen, C3-C6 cycloalkyl optionally substituted with one or more halogen, C2-C6 alkylcarbonyl optionally substituted with one or more halogen, C2-C5 alkoxy carbonyl optionally substituted with one or more halogen; or hydrogen,

R<sup>10</sup> and R<sup>11</sup> each represent C1-C5 alkyl optionally substituted with one or more halogen, C3-C5 alkenyl optionally substituted with one or more halogen, C3-C5 alkynyl optionally substituted with one or more halogen, C3-C6 cycloalkyl optionally substituted with one or more halogen, (C1-C5 alkoxy optionally substituted with one or more halogen)C1-C3 alkyl, C1-C5 alkylsulfinyl optionally substituted with one or more halogen, C1-C5 alkylsulfonyl optionally substituted with one or more halogen, C2-C6 alkylcarbonyl optionally substituted with one or more halogen, C2-C5 alkoxy carbonyl optionally substituted with one or more halogen, or hydrogen,

or the group represented by NR<sup>10</sup>R<sup>11</sup> is 1-pyrrolyl,

R<sup>12</sup> and R<sup>13</sup> each represent C1-C5 alkyl optionally substituted with one or more halogen, C3-C5 alkenyl optionally substituted with one or more halogen, C3-C5

alkynyl optionally substituted with one or more halogen, C3-C6 cycloalkyl optionally substituted with one or more halogen, a group represented by  $(\text{CH}_2)_m\text{Q}$ , or hydrogen, or  $\text{R}^{12}$  and  $\text{R}^{13}$  are taken together to represent C2-C6

5 alkanediyl optionally substituted with one or more halogen or C4-C6 alkenediyl optionally substituted with one or more halogen,

$\text{R}^{17}$  and  $\text{R}^{18}$  each represent C1-C5 alkyl optionally substituted with one or more halogen, C3-C5 alkenyl

10 optionally substituted with one or more halogen, C3-C5 alkynyl optionally substituted with one or more halogen, C3-C6 cycloalkyl optionally substituted with one or more halogen, a group represented by  $(\text{CH}_2)_m\text{Q}$ , or hydrogen,

$\text{R}^{19}$  represents C1-C5 alkyl optionally substituted with one

15 or more halogen, C3-C5 alkenyl optionally substituted with one or more halogen, C3-C5 alkynyl optionally substituted with one or more halogen, C3-C6 cycloalkyl optionally substituted with one or more halogen, (C1-C5 alkoxy

optionally substituted with one or more halogen)C1-C3 alkyl,

20 C1-C5 alkylsulfinyl optionally substituted with one or more halogen, C1-C5 alkylsulfonyl optionally substituted with one or more halogen, C2-C6 alkylcarbonyl optionally substituted with one or more halogen, C2-C5 alkoxycarbonyl

optionally substituted with one or more halogen, a group

25 represented by  $\text{C}(\text{=X}^5)\text{NR}^{12}\text{R}^{13}$ , a group represented by  $(\text{CH}_2)_m\text{Q}$ ,

trialkylsilyl, or hydrogen,

R<sup>20</sup> and R<sup>21</sup> each represent C1-C5 alkyl optionally substituted with one or more halogen, C2-C5 alkenyl optionally substituted with one or more halogen, C2-C5 alkynyl optionally substituted with one or more halogen, C3-C6 cycloalkyl optionally substituted with one or more halogen, or hydrogen,

Q represents aryl optionally substituted with R<sup>14</sup> n times,

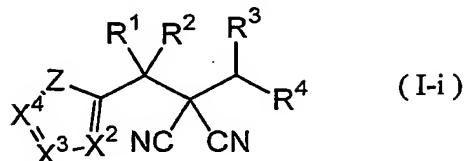
R<sup>14</sup> independently represents C1-C5 alkyl optionally substituted with one or more halogen, C3-C6 cycloalkyl optionally substituted with one or more halogen, C1-C5 alkoxy optionally substituted with one or more halogen, C1-C5 alkylthio optionally substituted with one or more halogen, C3-C5 alkenylthio optionally substituted with one or more halogen, C3-C5 alkynylthio optionally substituted with one or more halogen, C1-C5 alkylsulfinyl optionally substituted with one or more halogen, C1-C5 alkylsulfonyl optionally substituted with one or more halogen, C2-C6 alkylcarbonyl optionally substituted with one or more halogen, C2-C5 alkoxycarbonyl optionally substituted with one or more halogen, or halogen,

m and n each represent an integer of 0 to 5, and

X<sup>5</sup> represents oxygen or sulfur.

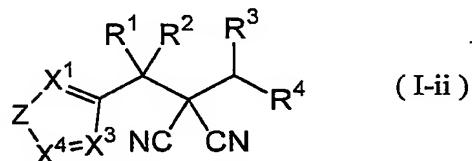
25 2. The malononitrile compound according to claim 1, which

is represented by the formula (I-i):



wherein  $R^1$ ,  $R^2$ ,  $R^3$ ,  $R^4$  and  $Z$  are as defined in claim 1, one to three of  $X^2$ ,  $X^3$  and  $X^4$  represent nitrogen and when one or two of  $X^2$ ,  $X^3$  and  $X^4$  represent nitrogen, the other two or one represents  $CR^5$ , and  $R^5$  is as defined in claim 1.

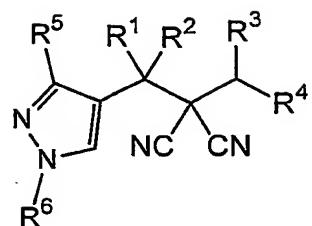
3. The malononitrile compound according to claim 1, which is represented by the formula (I-ii):



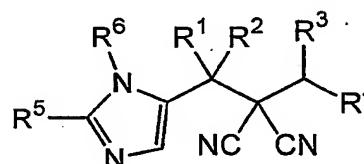
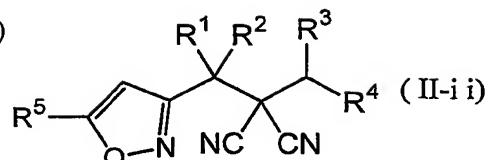
wherein  $R^1$ ,  $R^2$ ,  $R^3$ ,  $R^4$  and  $Z$  are as defined in claim 1, one to three of  $X^1$ ,  $X^3$  and  $X^4$  represent nitrogen and when one or two of  $X^1$ ,  $X^3$  and  $X^4$  represent nitrogen, the other two or one represents  $CR^5$ , and  $R^5$  is as defined in claim 1.

15

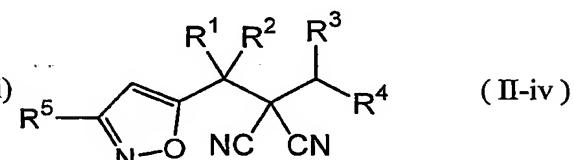
4. The malononitrile compound according to claim 1, which is represented by any one of the formula (II-i) to (II-xiii):



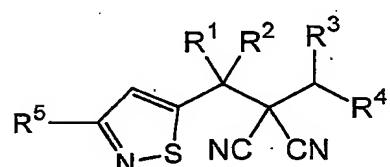
(II-i)



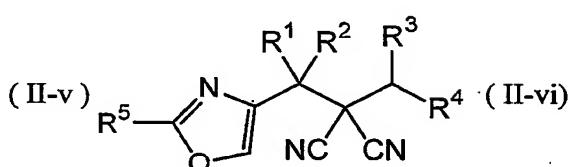
(II-iii)



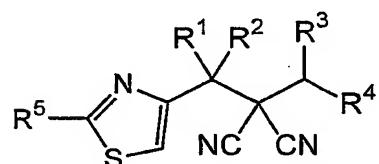
(II-iv)



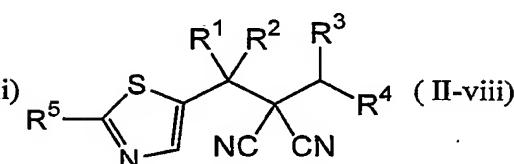
(II-v)



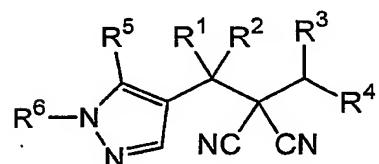
(II-vi)



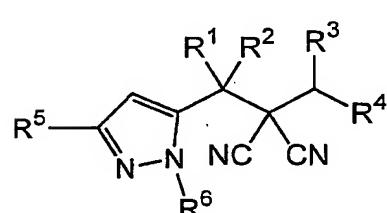
(II-vii)



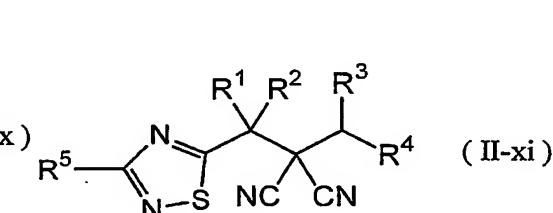
(II-viii)



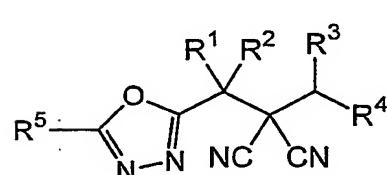
(II-ix)



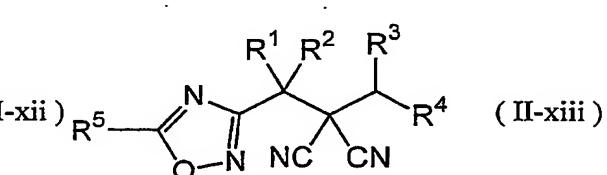
(II-x)



(II-xi)



(II-xii)



(II-xiii)

wherein R<sup>1</sup> represents C1-C5 alkyl optionally substituted with one or more halogen, C2-C5 alkenyl optionally

substituted with one or more halogen, C<sub>2</sub>-C<sub>5</sub> alkynyl  
optionally substituted with one or more halogen, or  
hydrogen,

R<sup>2</sup> represents C<sub>1</sub>-C<sub>5</sub> alkyl optionally substituted with one  
or more halogen, C<sub>1</sub>-C<sub>5</sub> alkoxy optionally substituted with  
one or more halogen, C<sub>2</sub>-C<sub>5</sub> alkenyl optionally substituted  
with one or more halogen, C<sub>2</sub>-C<sub>5</sub> alkynyl optionally  
substituted with one or more halogen, cyano or hydrogen,

R<sup>3</sup> and R<sup>4</sup> each represent C<sub>1</sub>-C<sub>5</sub> alkyl optionally substituted  
with one or more halogen, C<sub>2</sub>-C<sub>5</sub> alkenyl optionally  
substituted with one or more halogen, C<sub>2</sub>-C<sub>5</sub> alkynyl  
optionally substituted with one or more halogen, C<sub>3</sub>-C<sub>5</sub>  
cycloalkyl optionally substituted with one or more halogen,  
C<sub>4</sub>-C<sub>5</sub> cycloalkenyl optionally substituted with one or more  
halogen, or hydrogen,

or R<sup>3</sup> and R<sup>4</sup> are taken together to represent C<sub>2</sub>-C<sub>6</sub>  
alkanediyl optionally substituted with one or more halogen  
or C<sub>4</sub>-C<sub>6</sub> alkenediyl optionally substituted with one or more  
halogen,

R<sup>5</sup> represents halogen, cyano, nitro, formyl, SF<sub>5</sub>, C<sub>1</sub>-C<sub>5</sub>  
alkyl optionally substituted with one or more halogen, C<sub>2</sub>-  
C<sub>5</sub> alkenyl optionally substituted with one or more halogen,  
C<sub>2</sub>-C<sub>5</sub> alkynyl optionally substituted with one or more  
halogen, C<sub>3</sub>-C<sub>6</sub> cycloalkyl optionally substituted with one  
or more halogen or one or more C<sub>1</sub>-C<sub>3</sub> alkyl, C<sub>1</sub>-C<sub>5</sub> alkoxy

optionally substituted with one or more halogen, C3-C6  
alkenyloxy optionally substituted with one or more halogen,  
C3-C6 alkynyloxy optionally substituted with one or more  
halogen, C1-C5 alkylthio optionally substituted with one or  
5 more halogen, C3-C5 alkenylthio optionally substituted with  
one or more halogen, C3-C5 alkynylthio optionally  
substituted with one or more halogen, C1-C5 alkylsulfinyl  
optionally substituted with one or more halogen, C1-C5  
alkylsulfonyl optionally substituted with one or more  
halogen, C2-C6 alkylcarbonyl optionally substituted with  
10 one or more halogen, a group represented by  $C(OR^{19})R^{20}R^{21}$ , or  
hydrogen,

$R^6$  represents C1-C5 alkyl optionally substituted with one  
or more halogen,

15  $R^{19}$  represents C1-C5 alkyl optionanlly substituted with one  
or more halogen, C3-C5 alkynyl optionanlly substituted with  
one or more halogen, or hydrogen, and  
 $R^{20}$  and  $R^{21}$  each represent C1-C5 alkyl optionanlly  
substituted with one or more halogen,or hydrogen.

20

5. The malononitrile compound according to claim 4,  
wherein  $R^1$  is hydrogen,

$R^2$  is C1-C5 alkyl optionally substituted with one or more  
halogen, or hydrogen,

25  $R^3$  and  $R^4$  each are C1-C5 alkyl optionally substituted with

one or more halogen, C2-C5 alkenyl optionally substituted with one or more halogen, or hydrogen,

R<sup>5</sup> is halogen, C1-C5 alkyl optionally substituted with one or more halogen, C3-C6 cycloalkyl optionally substituted

5 with one or more halogen, C1-C5 alkoxy optionally substituted with one or more halogen, C3-C6 alkenyloxy optionally substituted with one or more halogen, C3-C6 alkynyloxy optionally substituted with one or more halogen, C1-C5 alkylthio optionally substituted with one or more halogen, C1-C5 alkylsulfinyl optionally substituted with one or more halogen, C1-C5 alkylsulfonyl optionally substituted with one or more halogen, a group represented by C(OR<sup>19</sup>)R<sup>20</sup>R<sup>21</sup>, or hydrogen,

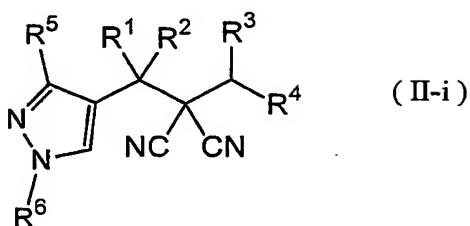
10 R<sup>6</sup> is C1-C5 alkyl optionally substituted with one or more halogen,

15 R<sup>19</sup> represents C1-C5 alkyl optionanlly substituted with one or more halogen, C3-C5 alkynyl optionanlly substituted with one or more halogen, or hydrogen, and

R<sup>20</sup> and R<sup>21</sup> each represent C1-C5 alkyl optionanlly

20 substituted with one or more halogen, or hydrogen.

6. The malononitrile compound according to claim 1, which is represented by the formula (II-i):



wherein R<sup>1</sup> represents C1-C5 alkyl optionally substituted with one or more halogen, C2-C5 alkenyl optionally substituted with one or more halogen, C2-C5 alkynyl optionally substituted with one or more halogen, or hydrogen,

R<sup>2</sup> represents C1-C5 alkyl optionally substituted with one or more halogen, C1-C5 alkoxy optionally substituted with one or more halogen, C2-C5 alkenyl optionally substituted with one or more halogen, C2-C5 alkynyl optionally substituted with one or more halogen, cyano or hydrogen,

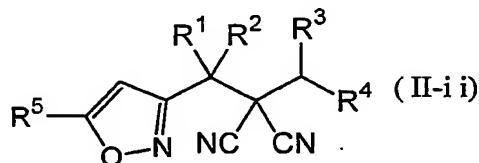
R<sup>3</sup> and R<sup>4</sup> each represent C1-C5 alkyl optionally substituted with one or more halogen, C2-C5 alkenyl optionally substituted with one or more halogen, C2-C5 alkynyl optionally substituted with one or more halogen, C3-C5 cycloalkyl optionally substituted with one or more halogen, C4-C5 cycloalkenyl optionally substituted with one or more halogen, or hydrogen,

or R<sup>3</sup> and R<sup>4</sup> are taken together to represent C2-C6 alkanediyl optionally substituted with one or more halogen or C4-C6 alkenediyl optionally substituted with one or more halogen,

R<sup>5</sup> represents halogen, cyano, nitro, formyl, SF<sub>5</sub>, C<sub>1</sub>-C<sub>5</sub> alkyl optionally substituted with one or more halogen, C<sub>2</sub>-C<sub>5</sub> alkenyl optionally substituted with one or more halogen, C<sub>2</sub>-C<sub>5</sub> alkynyl optionally substituted with one or more halogen, C<sub>3</sub>-C<sub>6</sub> cycloalkyl optionally substituted with one or more halogen or one or more C<sub>1</sub>-C<sub>3</sub> alkyl, C<sub>1</sub>-C<sub>5</sub> alkoxy optionally substituted with one or more halogen, C<sub>3</sub>-C<sub>6</sub> alkenyloxy optionally substituted with one or more halogen, C<sub>3</sub>-C<sub>6</sub> alkynyloxy optionally substituted with one or more halogen, C<sub>1</sub>-C<sub>5</sub> alkylthio optionally substituted with one or more halogen, C<sub>3</sub>-C<sub>5</sub> alkenylthio optionally substituted with one or more halogen, C<sub>3</sub>-C<sub>5</sub> alkynylthio optionally substituted with one or more halogen, C<sub>1</sub>-C<sub>5</sub> alkylsulfinyl optionally substituted with one or more halogen, C<sub>1</sub>-C<sub>5</sub> alkylsulfonyl optionally substituted with one or more halogen, C<sub>2</sub>-C<sub>6</sub> alkylcarbonyl optionally substituted with one or more halogen a group represented by C(OR<sup>19</sup>)R<sup>20</sup>R<sup>21</sup>, or hydrogen, R<sup>6</sup> represents C<sub>1</sub>-C<sub>5</sub> alkyl optionally substituted with one or more halogen,

R<sup>19</sup> represents C<sub>1</sub>-C<sub>5</sub> alkyl optionanlly substituted with one or more halogen, C<sub>3</sub>-C<sub>5</sub> alkynyl optionanlly substituted with one or more halogen, or hydrogen, and R<sup>20</sup> and R<sup>21</sup> each represent C<sub>1</sub>-C<sub>5</sub> alkyl optionanlly substituted with one or more halogen,or hydrogen.

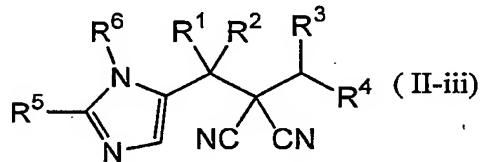
7. The malononitrile compound according to claim 1, which is represented by the formula (II-ii):



wherein R<sup>1</sup>, R<sup>2</sup>, R<sup>3</sup>, R<sup>4</sup> and R<sup>5</sup> are as defined in claim 6.

5

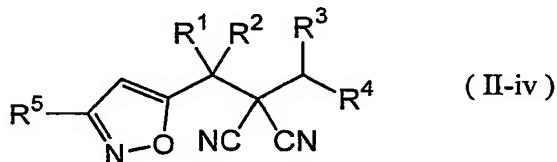
8. The malononitrile compound according to claim 1, which is represented by the formula (II-iii):



wherein R<sup>1</sup>, R<sup>2</sup>, R<sup>3</sup>, R<sup>4</sup>, R<sup>5</sup> and R<sup>6</sup> are as defined in claim 6.

10

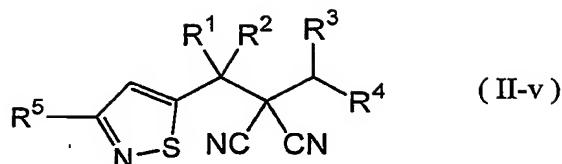
9. The malononitrile compound according to claim 1, which is represented by the formula (II-iv):



wherein R<sup>1</sup>, R<sup>2</sup>, R<sup>3</sup>, R<sup>4</sup> and R<sup>5</sup> are as defined in claim 6.

15

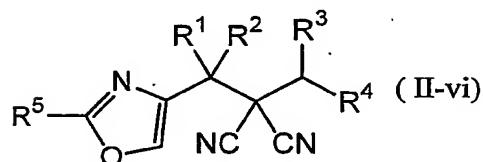
10. The malononitrile compound according to claim 1, which is represented by the formula (II-v):



wherein  $R^1$ ,  $R^2$ ,  $R^3$ ,  $R^4$  and  $R^5$  are as defined in claim 6.

11. The malononitrile compound according to claim 1, which

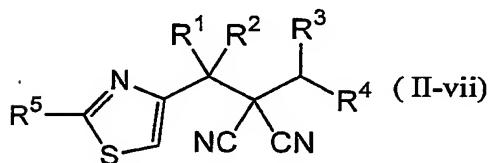
5 is represented by the formula (II-vi):



wherein  $R^1$ ,  $R^2$ ,  $R^3$ ,  $R^4$  and  $R^5$  are as defined in claim 6.

12. The malononitrile compound according to claim 1, which

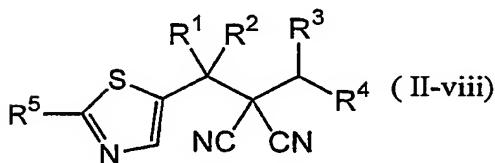
10 is represented by the formula (II-vii):



wherein  $R^1$ ,  $R^2$ ,  $R^3$ ,  $R^4$  and  $R^5$  are as defined in claim 6.

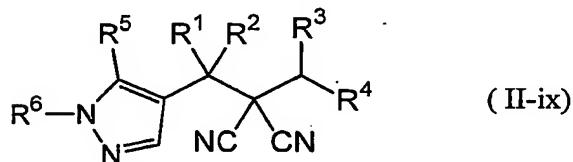
13. The malononitrile compound according to claim 1, which

15 is represented by the formula (II-viii):



wherein  $R^1$ ,  $R^2$ ,  $R^3$ ,  $R^4$  and  $R^5$  are as defined in claim 6.

14. The malononitrile compound according to claim 1, which is represented by the formula (II-ix):



5 wherein R<sup>1</sup>, R<sup>2</sup>, R<sup>3</sup>, R<sup>4</sup>, R<sup>5</sup> and R<sup>6</sup> are as defined in claim 6.

15. The malononitrile compound according to any one of claims 6 to 14, wherein R<sup>1</sup> is hydrogen,

10 R<sup>2</sup> is C1-C5 alkyl optionally substituted with one or more halogen, or hydrogen,

R<sup>3</sup> and R<sup>4</sup> each are C1-C5 alkyl optionally substituted with one or more halogen, C2-C5 alkenyl optionally substituted with one or more halogen, or hydrogen,

15 R<sup>5</sup> is halogen, C1-C5 alkyl optionally substituted with one or more halogen, C3-C6 cycloalkyl optionally substituted

with one or more halogen, C1-C5 alkoxy optionally substituted with one or more halogen, C3-C6 alkenyloxy optionally substituted with one or more halogen, C3-C6 alkynyloxy optionally substituted with one or more halogen,

20 C1-C5 alkylthio optionally substituted with one or more halogen, C1-C5 alkylsulfinyl optionally substituted with one or more halogen, C1-C5 alkylsulfonyl optionally substituted with one or more halogen, a group represented

by  $C(OR^{19})R^{20}R^{21}$ , or hydrogen,

$R^6$  is C1-C5 alkyl optionally substituted with one or more halogen,

$R^{19}$  represents C1-C5 alkyl optionanlly substituted with one

5 or more halogen, C3-C5 alkynyl optionanlly substituted with one or more halogen, or hydrogen, and

$R^{20}$  and  $R^{21}$  each represent C1-C5 alkyl optionanlly substituted with one or more halogen, or hydrogen.

10 16. A pesticidal composition, which comprises an effective amount of the malononitrile compound according to claim 1 and an inert carrier.

15 17. A method for controlling a pest, which comprises applying an effective amount of the malononitrile compound according to claim 1 to said pest or a place where said pest inhabits.

20 18. A use of the malononitrile compound according to claim 1 as an active ingredient of a pesticidal composition.